

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086**  
**(For candidates admitted during the academic year 2019-2020 & thereafter)**

**M.Sc. DEGREE EXAMINATION – APRIL 2024**  
**BRANCH III - PHYSICS**  
**FOURTH SEMESTER**

**CODE : ELECTIVE**  
**PAPER : REACTOR PHYSICS**  
**SUBJECT CODE : 19PH/PE/RP15**  
**TIME : 3 HOURS**

**MAX. MARKS : 100**

**SECTION - A**

**(10 x 3 = 30)**

**I. ANSWER ALL QUESTIONS**

1. Define binding energy per nucleon.
2. What is radioactivity?
3. Define multiplication factor.
4. Mention the significance of neutron balance.
5. Define lethargy.
6. What is Fermi age theory?
7. Distinguish positive reactivity and negative reactivity of the reactor.
8. What is the temperature coefficient of reactivity in a nuclear reactor?
9. How does the control rod work?
10. What is the reactor core?

**SECTION – B**

**(5 x 5 = 25)**

**II. ANSWER ANY FIVE QUESTIONS**

11. Calculate the energy released from fission of 1g of  ${}_{92}^{235}\text{U}$ . Assuming that an energy of 200 MeV is released by fission of each atom of  ${}_{92}^{235}\text{U}$ .
12. State and explain reciprocity theorem.
13. Obtain Fermi age equation and discuss its boundary condition.
14. Discuss the infinite reactor without delayed neutrons.
15. Enumerate the safeguard measures for reactors.
16. Explain fuel burn up and consumption in nuclear reactor.
17. Briefly explain the classification of nuclear reactor on the basis of neutron energy

**SECTION – C**

**(3 x 15 = 45)**

**III. ANSWER ANY THREE QUESTIONS**

18. Discuss the phenomenon of nuclear fission and explain its mechanism.
19. Derive Ficks law of diffusion and validate it in neutron diffusion.
20. Discuss the theory of one finite thermal reactor and explain criticality.
21. Give an account of (a) Stable period (b) Prompt jump and (c) Prompt criticality
22. Obtain the expression for rod worth of small central cylindrical control rod by modified one group theory

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